SURE
electronics

4 inch Character Height
7-segment LED Information Board
User's Guide

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NOTES:

Product Version ： **Ver 1.0**
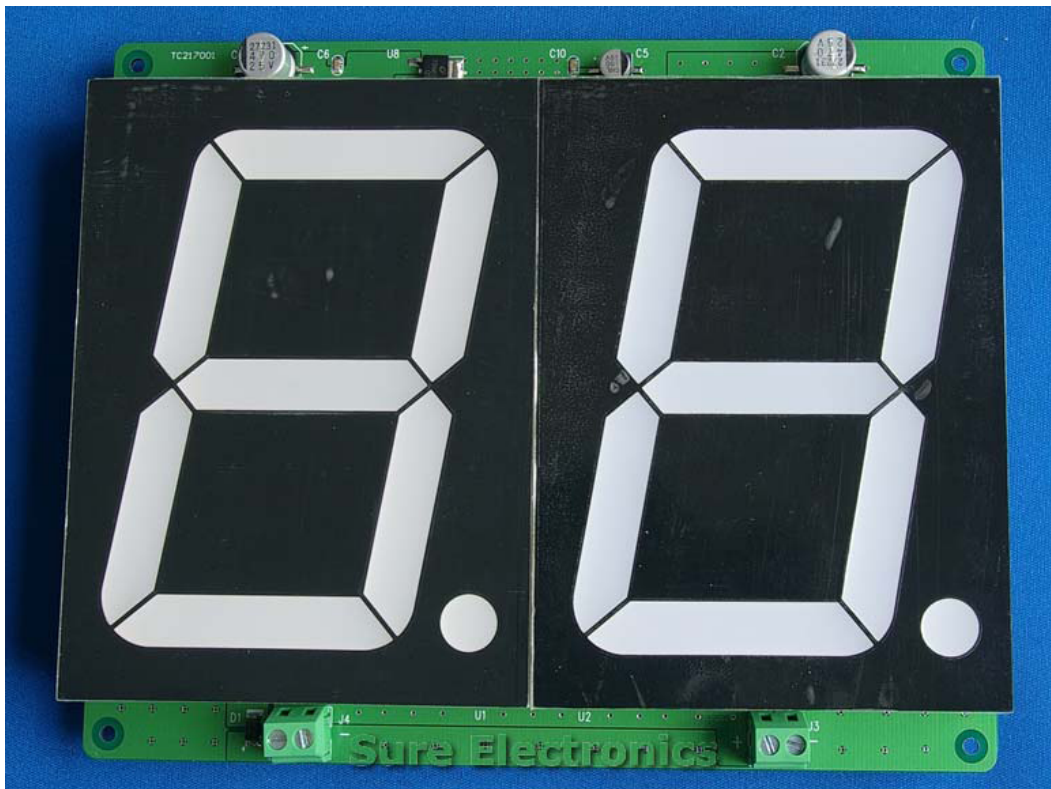
Document Version ： **Ver 1.0**

Chapter1.Overview and Main Feature

4 digits 7segment panels are manufactured by Sure Electronics. This series includes 5 different size panels, such as 1.5 inches, 1.8 inches, 2.3 inches, 4 inches, and 7 inches (character height). All those panels are driven by SPI like interface and all work in full static mode. They are easy to be interfaced to any Microcontrollers. They could be widely used in panel meters, big clocks and any other information display usage.

Sure Electronics provides series of such information boards which are supposed to reduce your development time and make them standard. In this series, most boards are 4 digits and static, if customer needs any special digits and special size ones, you could contact us with the contact information at the end of this document. The 4 inch character height one is 2digit/board. The 7inch character height one is 1digit/board.

This document is used to describe how to use 4 inch character height panels.

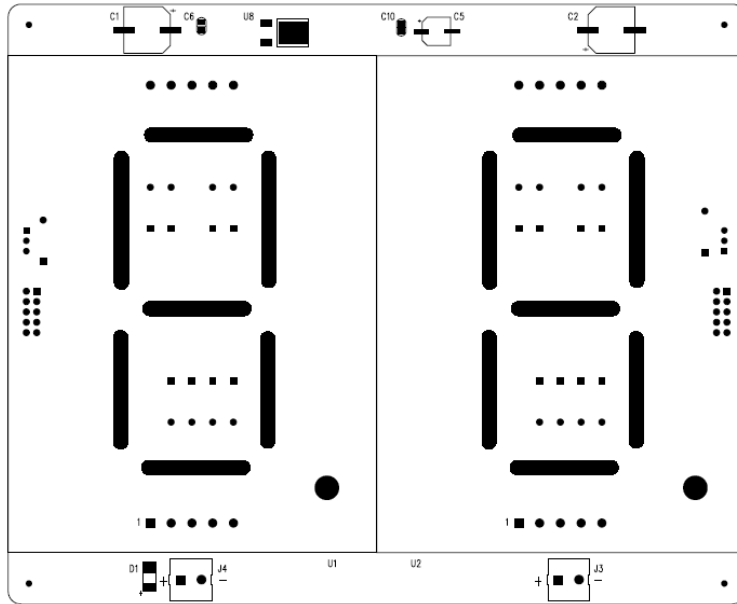## 1-1. Overview

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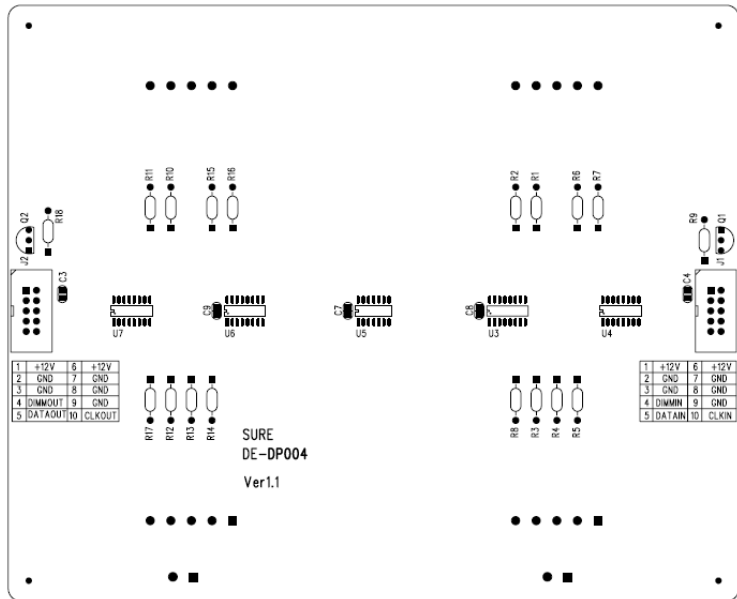## 1-2. Part Layout

Figure Top Part Layout

Figure 1 Bottom Part Layout

1-3. Main Feature

1-3-1. 2 digits 7-segment 4 inches LEDs are installed on this panel, those segments are common anode type.

1-3-2. 2*10pin interface for power serializing and data transferring, data inputs from J1 and flows out from J2.

1-3-3. A 74HC00 Nand chip is used to buffer CLK_IN and DIMM_IN control signal.

1-3-4. LED driver chips are composed of 2pcs of 74HC595, 2pcs MMBT9014 and 2pcs of ULN2003, they are serialized to each other, the first chip receives data from Microcontroller or the board ahead, the final chip shifts data to next boards. Data should be clocked in from CLK_IN and DATA_IN in J1, and DIMM_IN pin should be pulled down to enable display. ULN2003 is used to drive the cathode of those led segments.

Chapter2.Hardware Detail

2-1. Schematic

Figure 2

Note: Because of the LED's voltage drop difference, the resistance may vary from the value

marked in the schematic.

2-2.　Physical Dimension
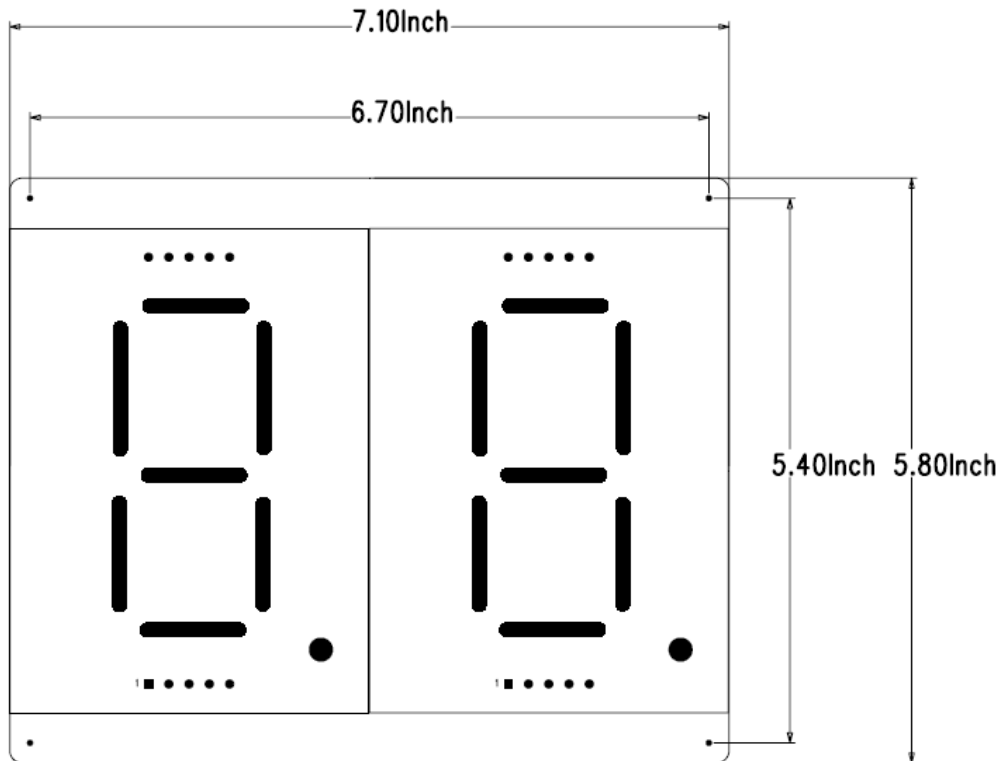
Figure 3

2-3.　Circuit Diagram

Figure 4

Figure 5

SURE
DE-DP004
Ver1.1

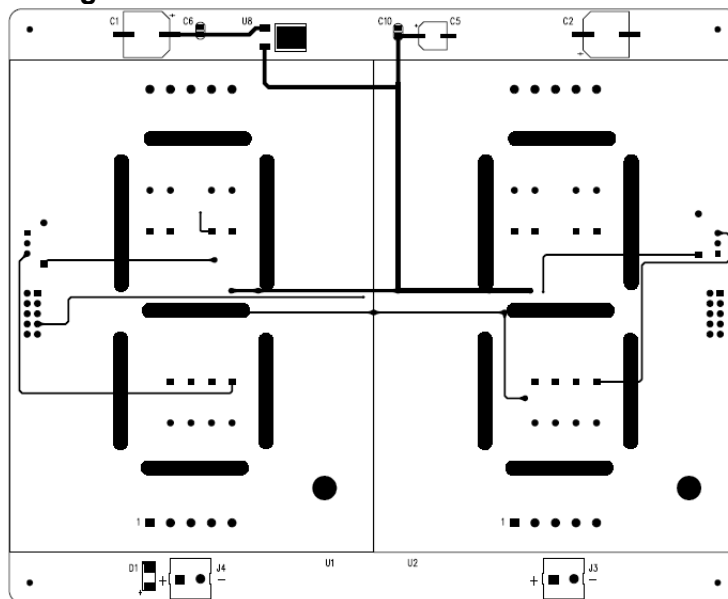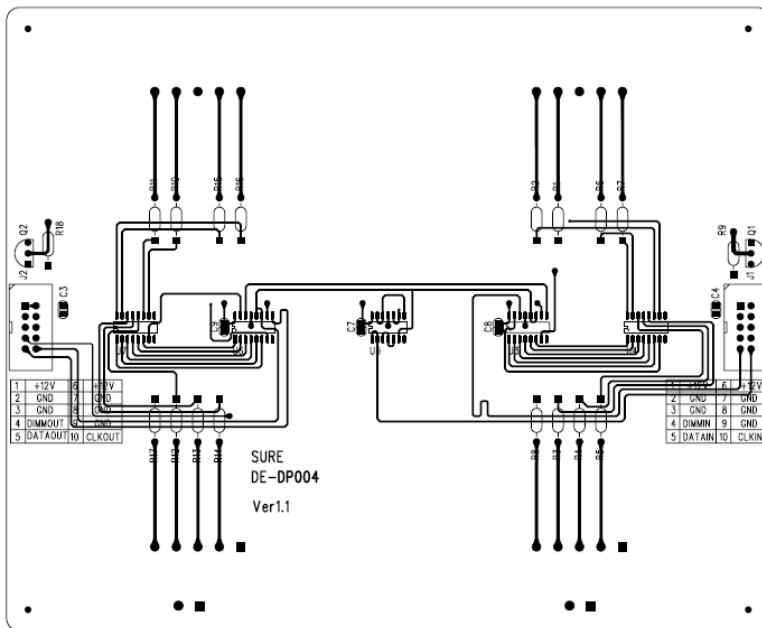## 2-4. Electric Characters

- Power Supply: DC12V (Low9V-High13V), 0.16A/pcs (Maximum), for each additional panel, adding another 0.16A, if voltage is less than 9V, the brightness would not be enough.

- For over 2 panels, users must add auxiliary power on the auxiliary power, or the 10pin communication port could not carry so much current.

- Maximum clock freq: 1MHz, 4 boards serialized
  100KHz, 20 boards serialized

- If the communication speed is too high, it may cause communication problems.

- Suggested Refresh Rate: Less than 10Hz if DIMM is not used. Less than 50Hz if DIMM is used.

- Drive Current/segment: 10mA +3mA/-2mA, this value may be changed based on the production batch, and the dot uses different current.

- Drive Method: Fully static.

- Connection Method: 74HC595 in series, SPI like interface.

- Maximum Cascade Level: 20 boards in series, clock less than 100 kHz.

- Interface Voltage Level: 4-5.5V, standard CMOS level. If you need TTL/CMOS compatible interface in batch, please contact us but the quantity should be no less than 100pcs.

2-5. Port Definition
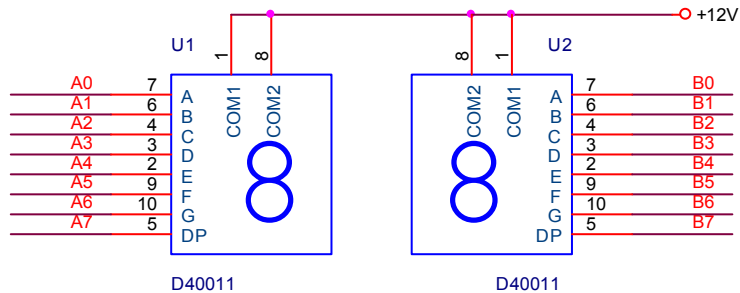### 2-5-1. 7-segment LED

Figure 6

2 Digits of 4 inches, common anode, high brightness red 7-segment LEDs are installed on this board. They are marked as U1-2.
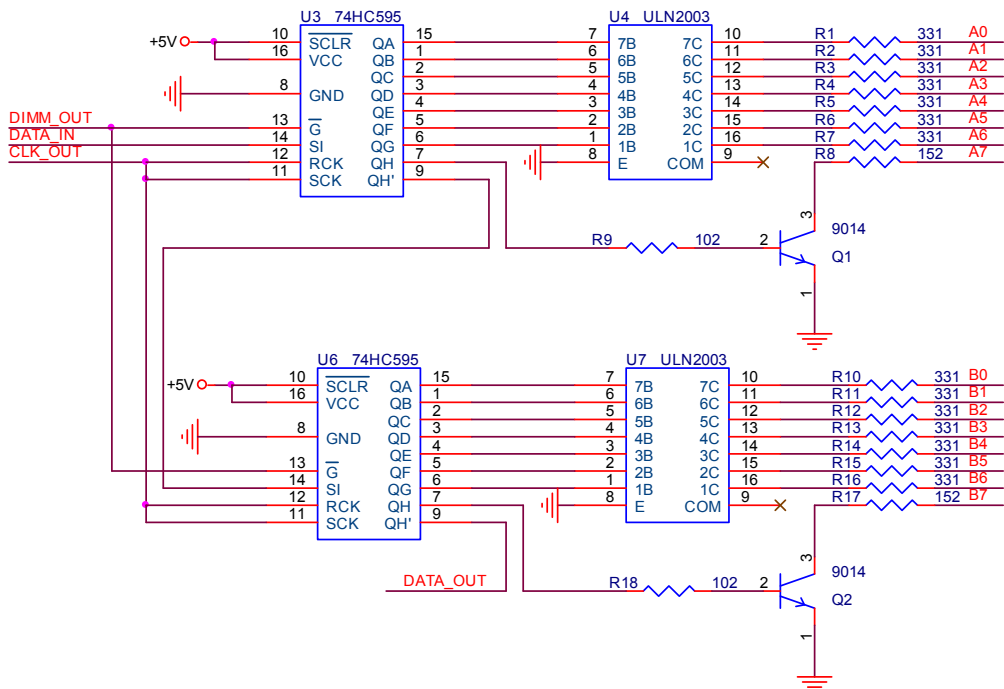
2-5-2. Shift Register Data Drive

Figure 7

74HC595 is used as shift register in this board. They are U3 and U6, the parallel output of those 74HC595 is connected to the base of ULN2003, and the collector of those ULN2003 is connected to the LED segments. CLK_OUT is driven by a buffered output from CLK_IN with 74HC00. DATA_IN is data input pin of the first 74HC595, then all 74HC595 of cascaded boards will be serialized. All those pins receive only CMOS signals. DIMM_IN signal is for brightness control usage, you could add simple on/off or PWM signal on this signal, when this signal is set to low, all segments will be lighted on if valid data is shifted out from the 74HC595 chip. If you change the data in the 74HC595 driven chip, you should set this pin to low in order that the hash signal will not affect the display. Of course if you want to adjust the brightness of those LEDs, PWM signal could be applied on the DIMM_IN pin. It is buffered with a 74HC00, and DIMM_IN signal will drive this board and next. Once you clock in correct data through these 2 pins, and ensure that PWM signal or ON/OFF signal is applied correctly on the DIMM_IN pin, the board will begin to display.

Correspondence between Character Codes and Character Patterns:

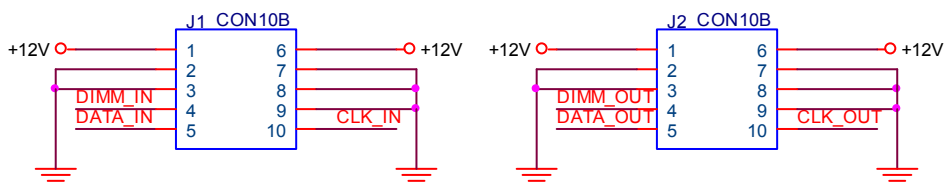| Character Patterns	0	1	2	3	4	5	6	7	8	9
Character Codes	0xfc	0x60	0xda	0xf2	0x66	0xb6	0xbe	0xe0	0xfe	0xf6
Character Patterns	**a**	**b**	**c**	**d**	**E**	**f**	**g**	**h**	**i**	**j**
Character Codes	0xee	0x3e	0x1a	0x7a	0x9e	0x8e	0xf6	0x6e	0x60	0x70
Character Patterns	**l**	**n**	**o**	**p**	**Q**	**r**	**s**	**t**	**u**	**y**
Character Codes	0x1c	0x2a	0x3a	0xce	0xe6	0x0a	0xb6	0xe0	0x38	0x76

2-5-3. Data Ports Definition

Figure 8

2 IDC sockets are located on the board. They are data input and output interface, marked as J1 and J2. The definition is shown in Figure 11. When the board is working separately, connect J1 to the Microcontroller board and leave J2 open. If lots of same boards are in series, connect next board's input to previous one's output. Then you could connect up to

20 boards in series. Notice if over 4pcs of such boards were serialized, you must add auxiliary power cable to some boards to enhance the current transfer.
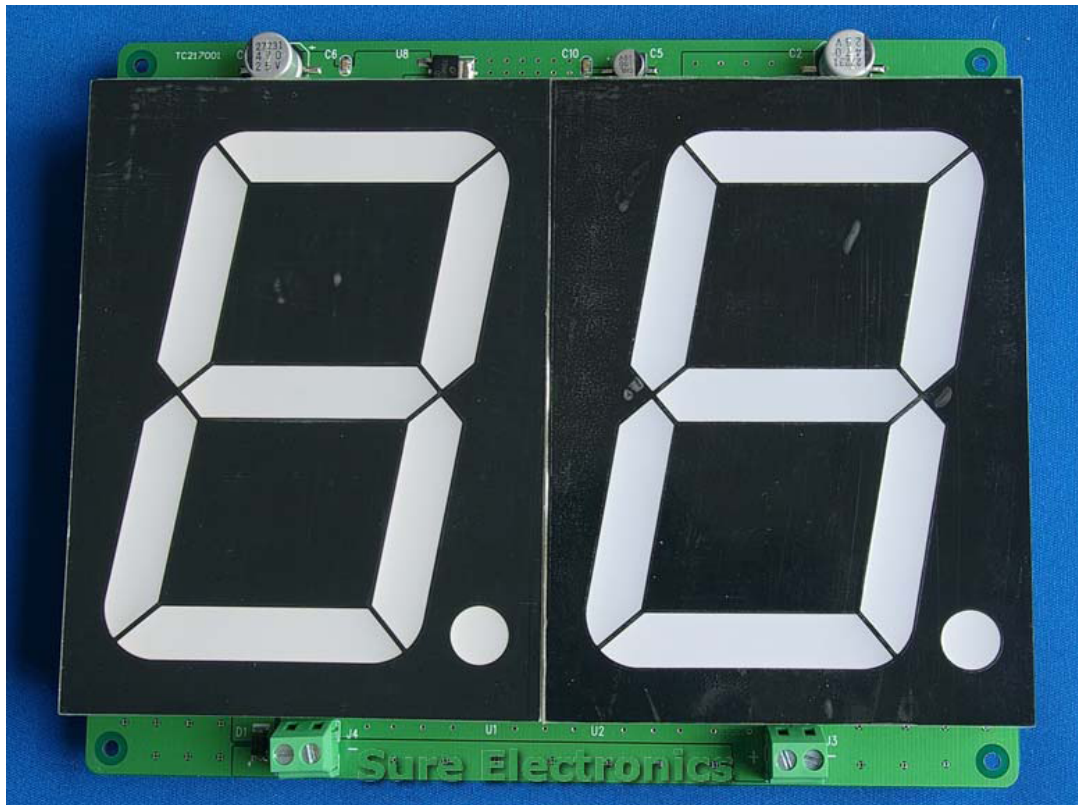
2-5-4.   Auxiliary Power Port

Figure 9

There are 2 auxiliary power ports on this board. If you use less than 4pcs of such boards in series, you could simply use a 10pin IDC flat cable to connect those boards. But if over 4 boards are connected together, you must add additional power supply to some of those boards, or the current may be lacking. Just apply +12V to some boards on the AUX power port. Make sure the polarity is correct.

2-5-5.   Data Buffer
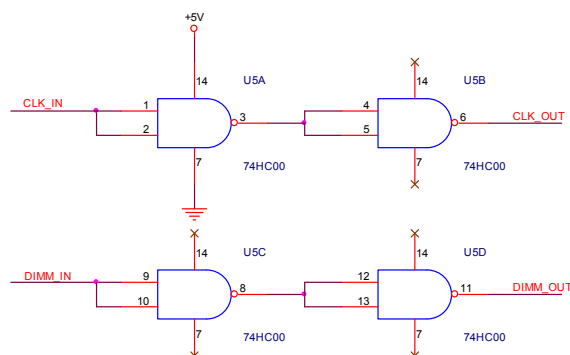
Figure 10

74HC00 chip is used to buffer Clock and DIMM signal in this board. A CMOS chip is not able to drive over 10pcs CMOS input if the cable is so long, here 74HC00 is used as NOT gate, and 2 gates in series is a buffer.

Chapter3.Sample Codes
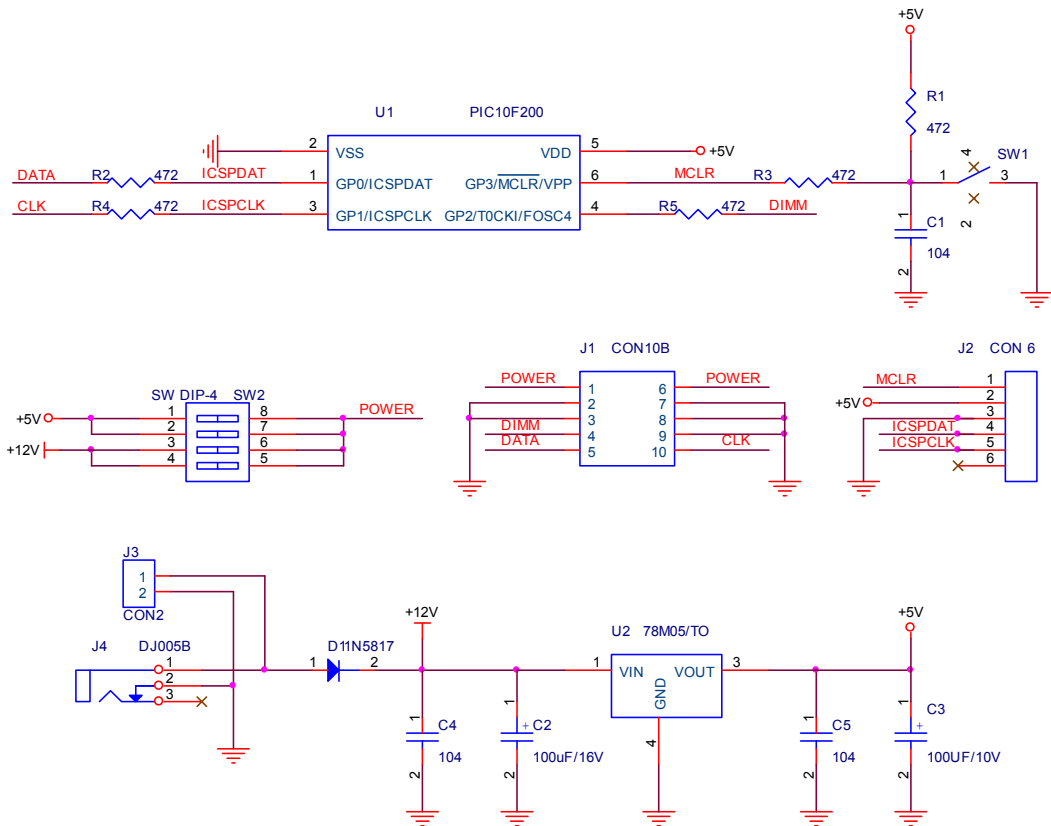
3-1. LED Segment Drive Demo Board's Schematic

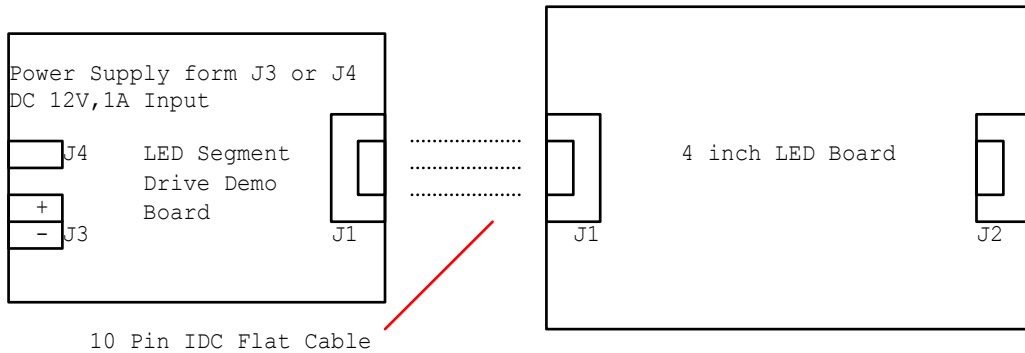Figure 11

Sample Codes

3-2. How to Connect Load

```
Power Supply form J3 or J4
DC 12V,1A Input

 J4      LED Segment
         Drive Demo
 +       Board
 - J3                  J1
```

```
4 inch LED Board

J1                          J2
```

....
....
....

10 Pin IDC Flat Cable

Figure 12

Output Voltage	Encoder Position Setting(1)(2)	
5V	4 3 2 1 +5V	ON
12V	4 3 2 1 +12V	
0V	4 3 2 1 0V	OFF

Notice:

(1) DIP switch only has the 3 ways as shown above to work; any other switching ways are prohibited.

(2) Users shouldn't change the voltage while LED Segment Drive Demo Board is working. It is only allowed to change it before applying the current.

3-3. How to display data with PIC10F200 and PICC8.05 environment
Source code is shown below,

#include <pic.h>

__CONFIG(UNPROTECT&MCLRDIS&WDTDIS);   //Configure Word

```
#define  Fuc_key     GP3
#define  DIMM        GP2
#define  CLK         GP1
#define  DATA        GP0

unsigned char disp_data;
unsigned char key_pressed,last_key_pressed;
unsigned char Value;
unsigned char time;

//The total of cathode
const            unsigned          char          Digital_TAB[]           =
{0xff,0xfc,0x60,0xda,0xf2,0x66,0xb6,0xbe,0xe0,0xfe,0xf6,
        0x80,0x40,0x20,0x10,0x08,0x04,0x02,0x01};

void change(void);
void LED_data(void);
void LED_display(void);

void delay_2ms(void)
{
    unsigned char i, j, k;
for(i = 0; i < 5; i++)
    {
        for(j = 0; j < 200; j++)
            k--;
    }
}

void change(void)
{
    key_pressed=Fuc_key;
    if((key_pressed==0)&(last_key_pressed==1))
    {
        delay_2ms();
        if(key_pressed==0)
        {
            disp_data++;
            if(disp_data==19)disp_data=0;
        }
    }
    last_key_pressed=key_pressed;
}

void LED_data(void)
{
    unsigned char i;

    for(i = 0; i <19; i++)
    {
        if(i==disp_data){Value = Digital_TAB[i];}
    }
```

Sample Codes

```
}

void LED_display(void)
{
    unsigned char i;
    unsigned char U;

    U=Value;
    for(i = 0;i < 8; i++)
    {
        DATA = U & 0x01;
        CLK = 0;
        CLK = 1;
        U = U>>1;
    }
    U=Value;
    for(i = 0;i < 8; i++)
    {
        DATA = U & 0x01;
        CLK = 0;
        CLK = 1;
        U = U>>1;
    }
    CLK = 0;
    CLK = 1;
}
void main(void)
{
    OSCCAL=0;
    TRIS = 0b11111000;
    OPTION=0b11011111;

    while(1)
    {
        change();
        LED_data();
        DIMM = 1;
        LED_display();
        DIMM = 0;                    //Active–low Output Enable

        delay_2ms();
    }
}
```

Chapter4.Contact Us

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